

FIG. 1A (PRIOR ART)

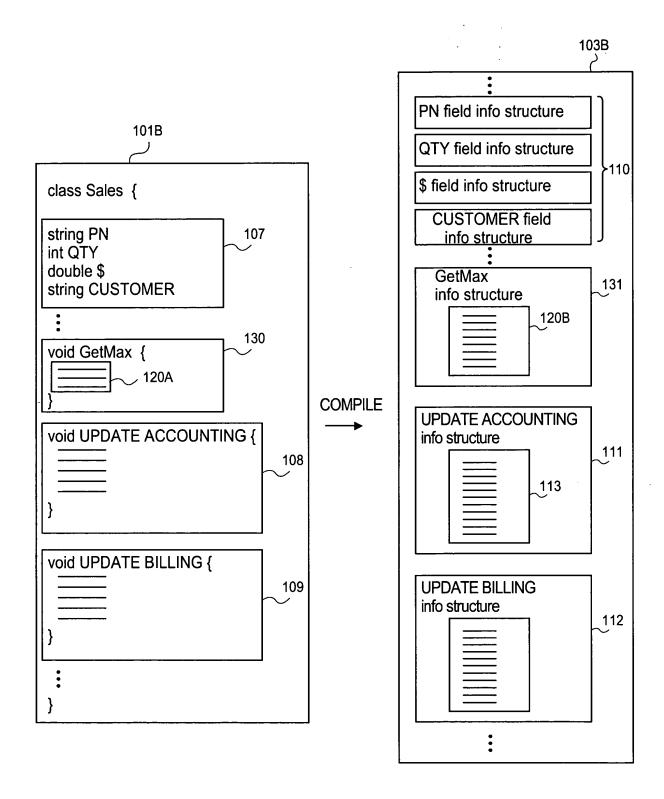


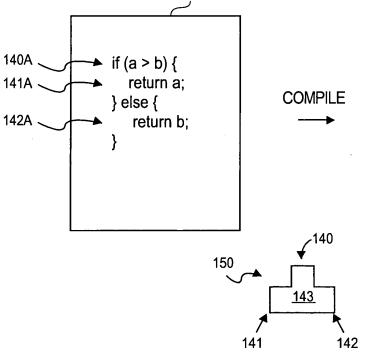
FIG. 1B (PRIOR ART)

"GetMax"
source code text:
eq

120A

if (a > b) {
return a:

"GetMax" equivalent byte code:



iload\_Ø iload\_1 icmp iFeq L\_Ø iload\_Ø ireturn LØ: iload\_1 ireturn 141B

FIG. 1C (PRIOR ART)

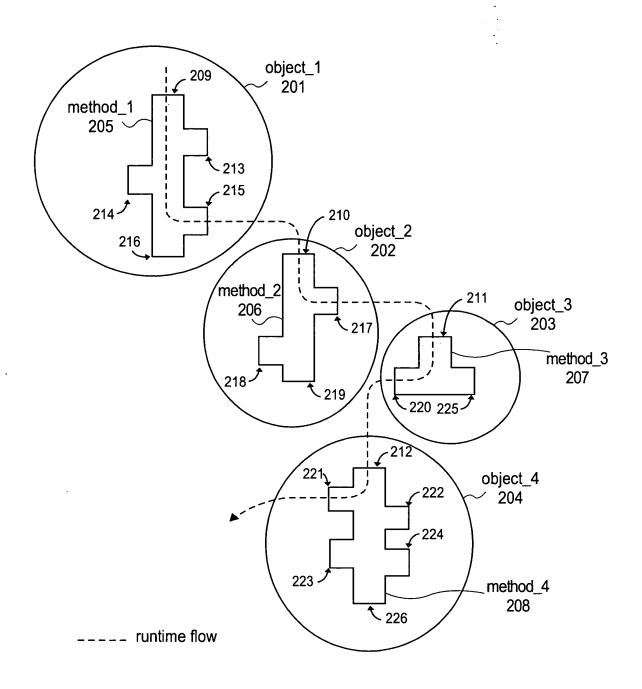


FIG. 1D (PRIOR ART)

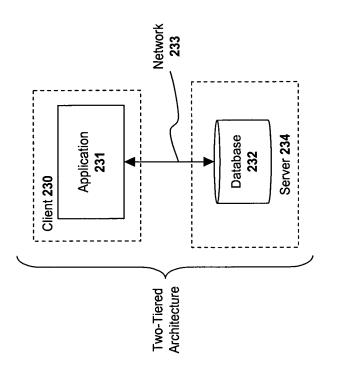
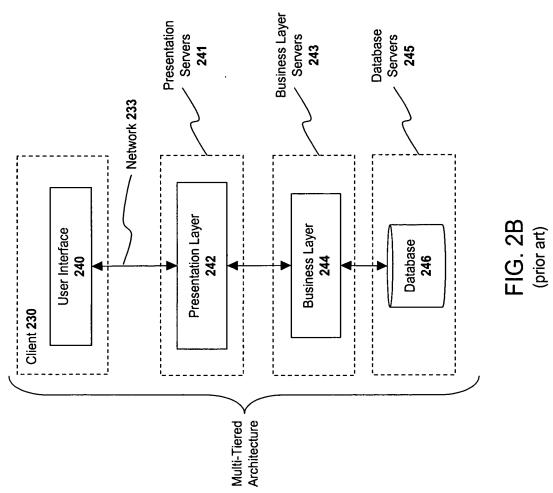
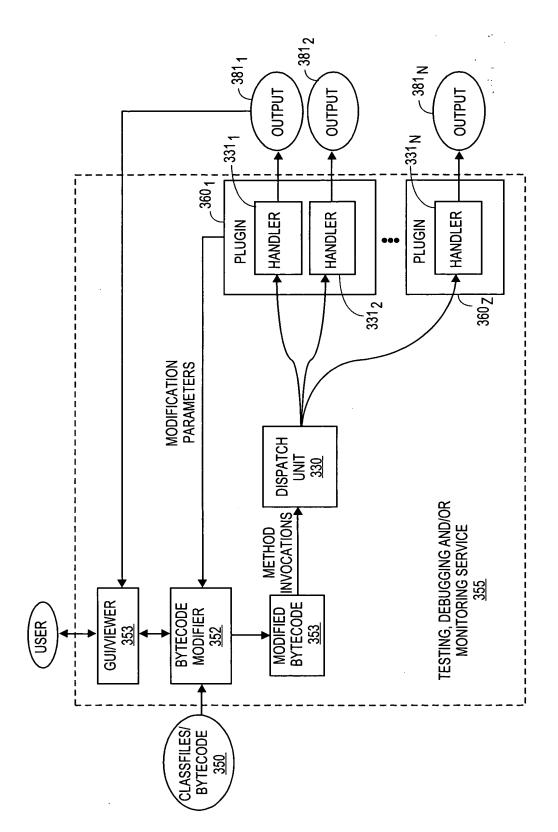


FIG. 2A (prior art)





**FIG. 3** 

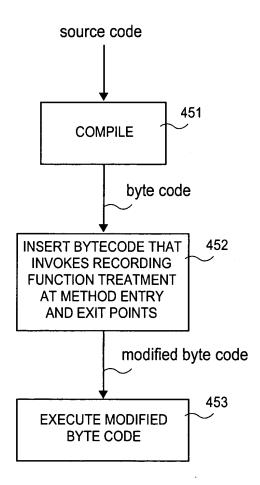
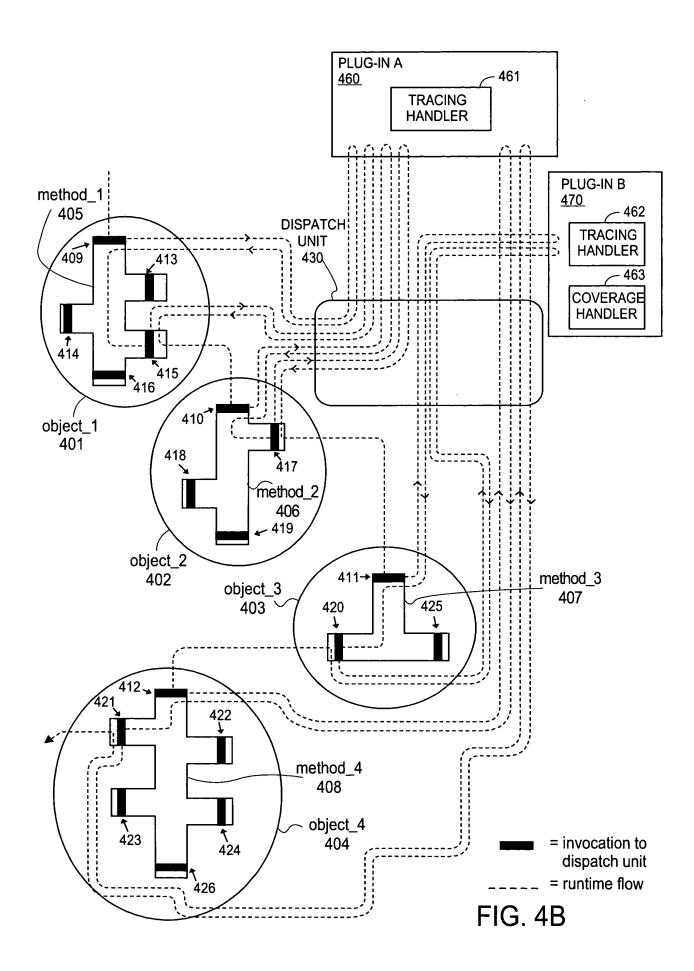
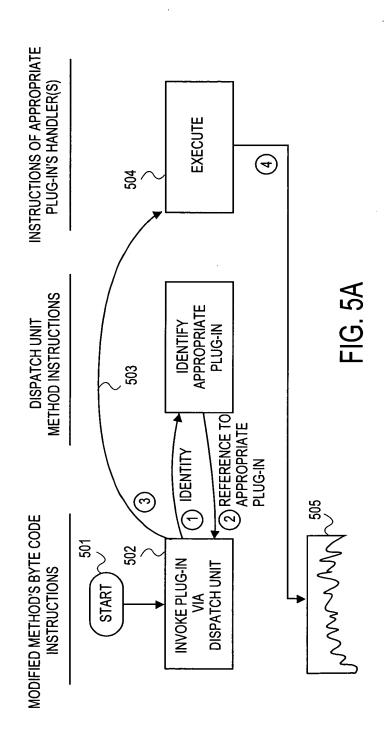
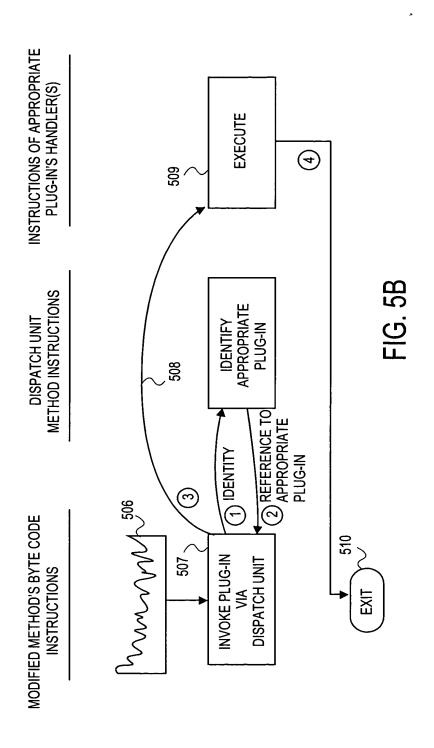
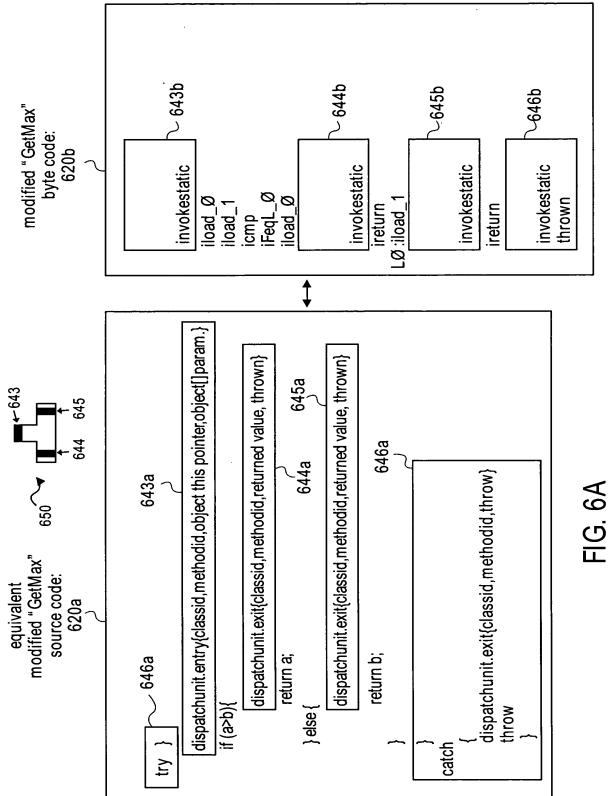


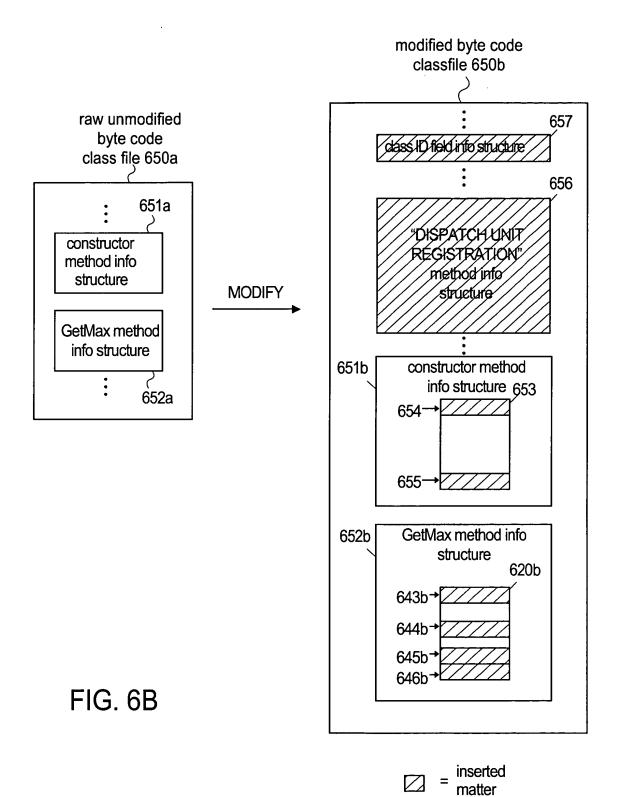
FIG. 4A











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	INVOKING METHOD	PLUG IN MODULE
(method_1)	C <sub>1</sub> , M <sub>1</sub> , args <sub>11</sub>	PIM_A
(method_2)	C <sub>1</sub> , M <sub>2</sub> , args <sub>12</sub>	PIM_A
(method_3)	C <sub>2</sub> , M <sub>1</sub> , args <sub>21</sub>	PIM_B
(method_4)	C <sub>3</sub> , M <sub>1</sub> , args <sub>31</sub>	PIM_A

FIG. 7

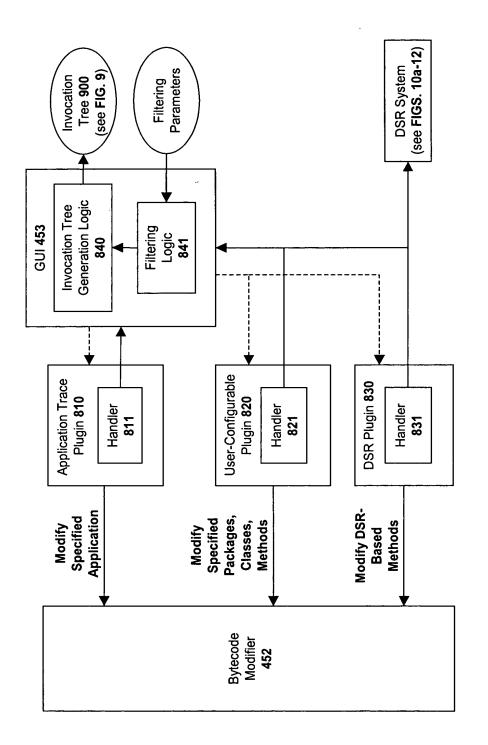
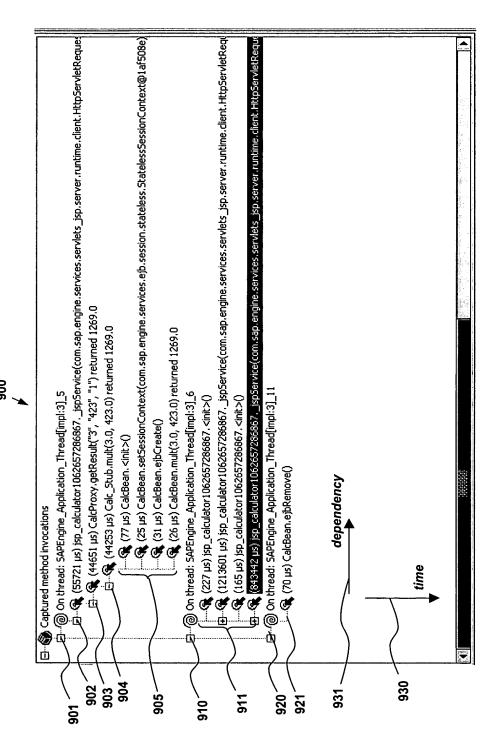


FIG. 8



Invocation Tree

FIG. 9A

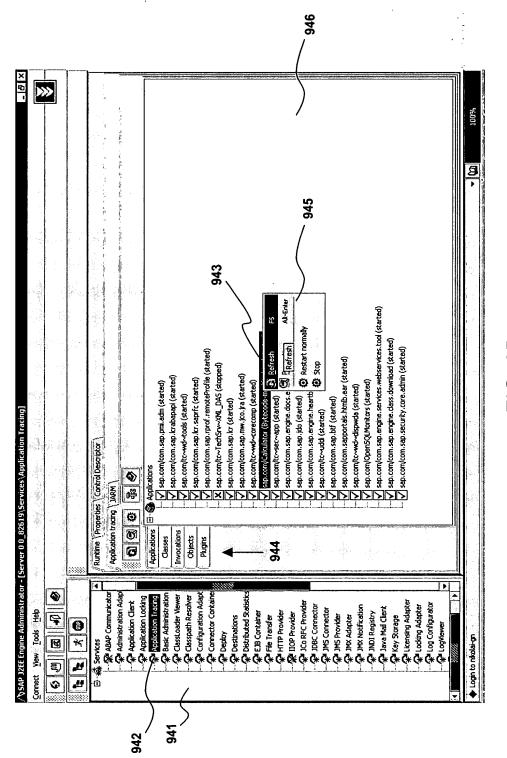


FIG. 9B

FIG. 9C

FIG. 9D

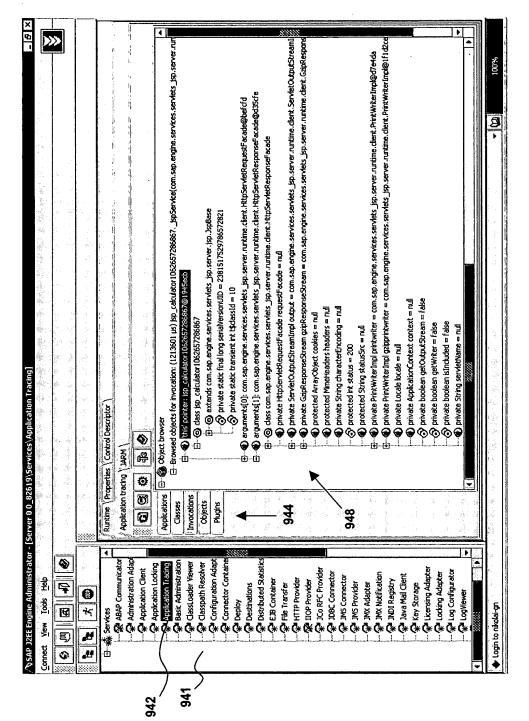


FIG. 9E

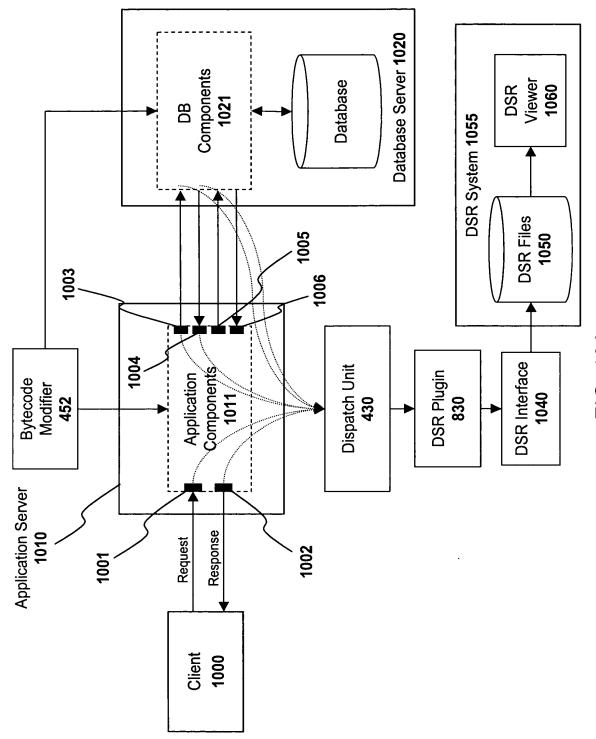


FIG. 10A

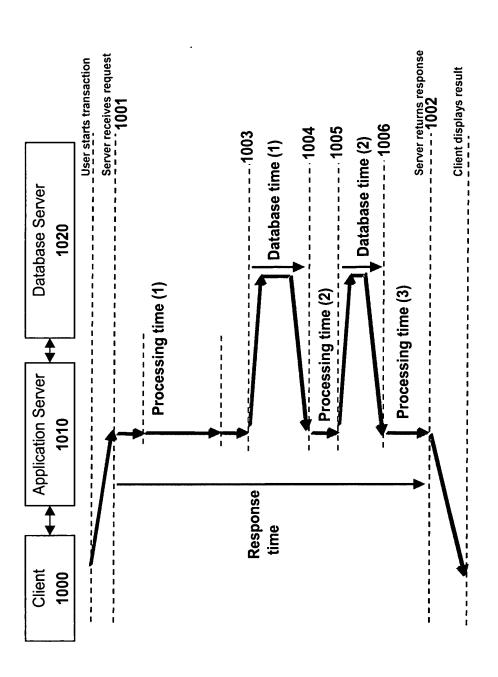


FIG. 10B

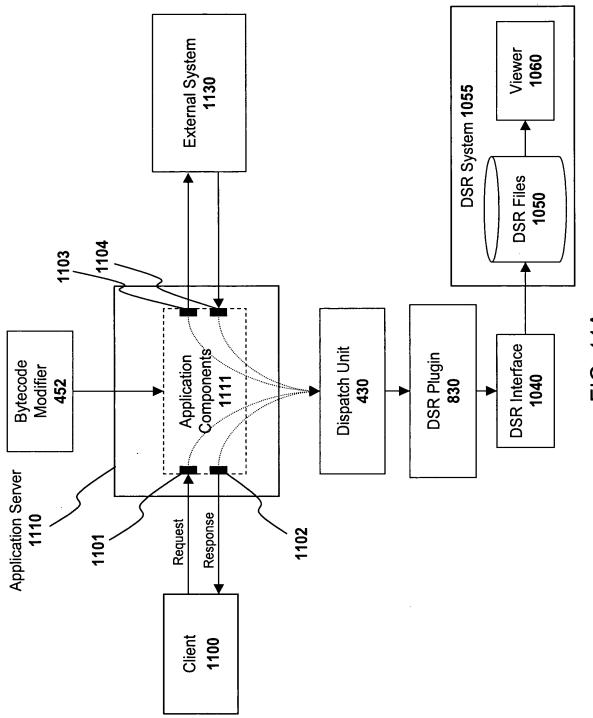


FIG. 11A

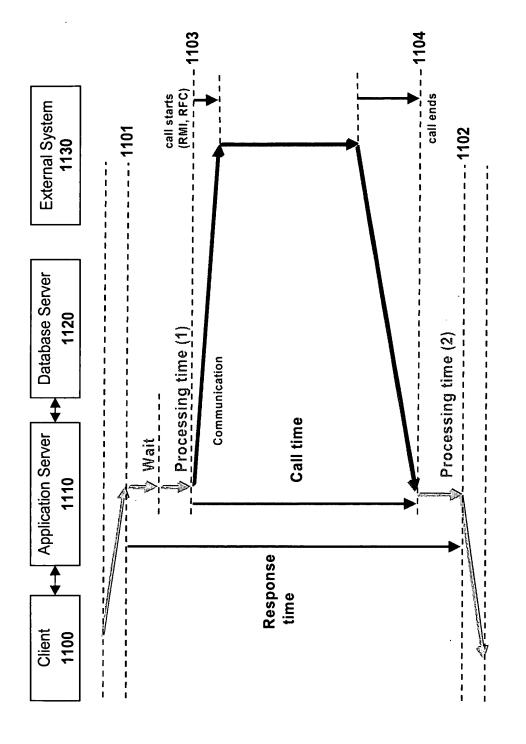


FIG. 11B

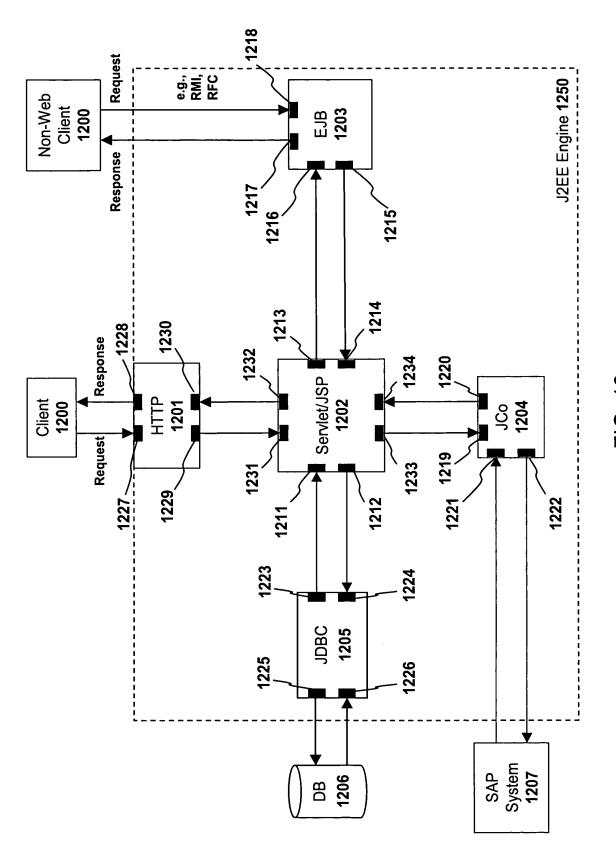


FIG. 12

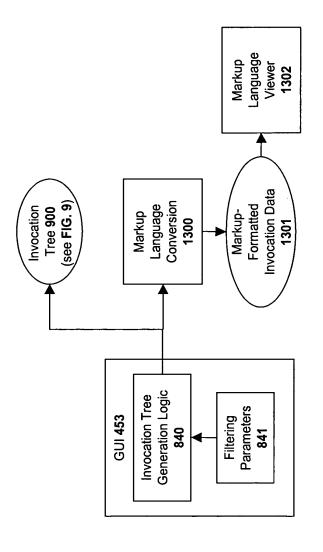


FIG. 13

## FOR EACH CLASSFILE HAVING A METHOD TO BE MODIFIED:

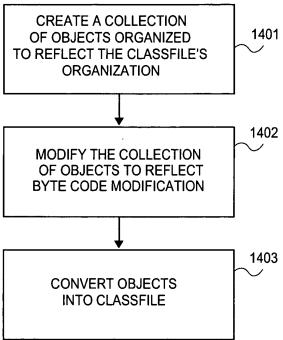
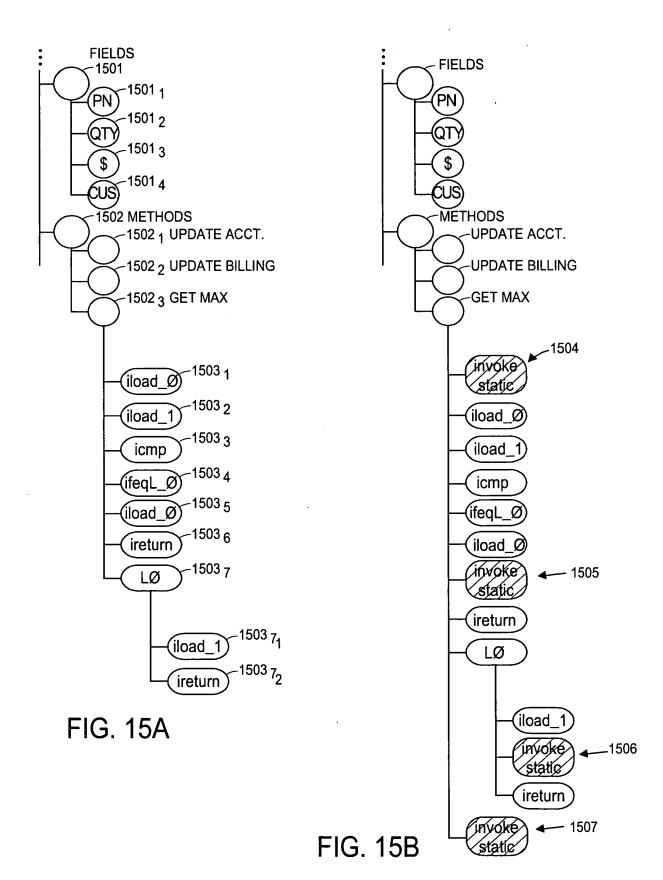


FIG. 14



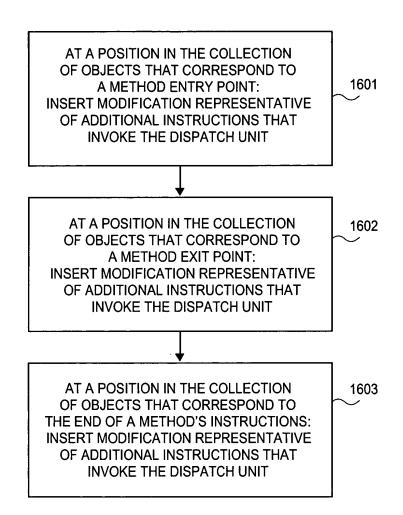
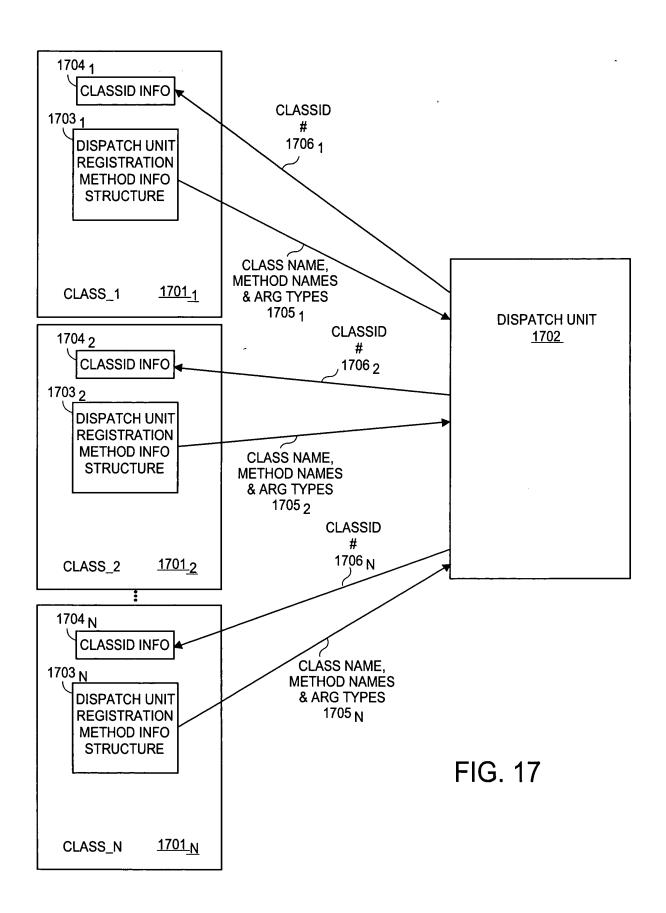


FIG. 16



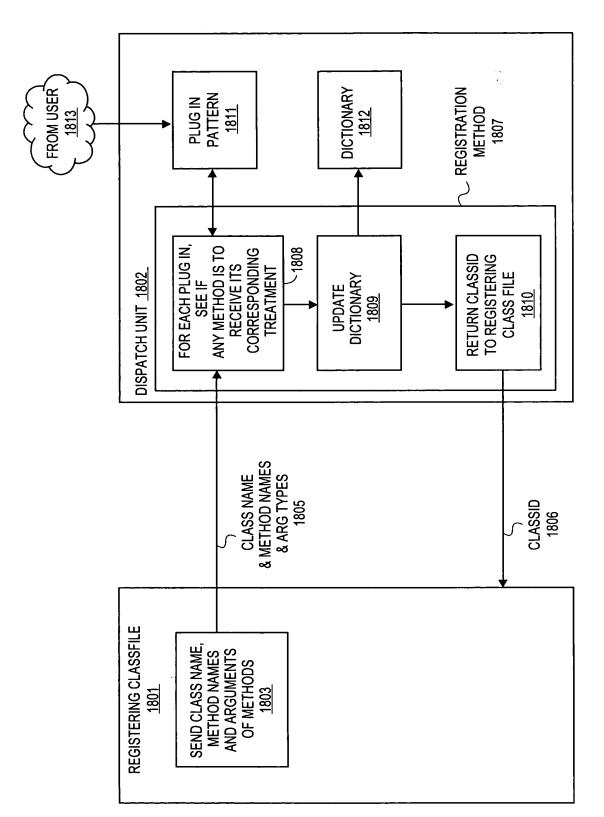


FIG. 18

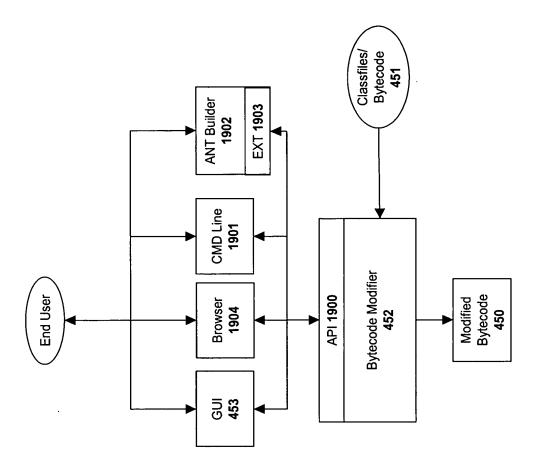


FIG. 19A

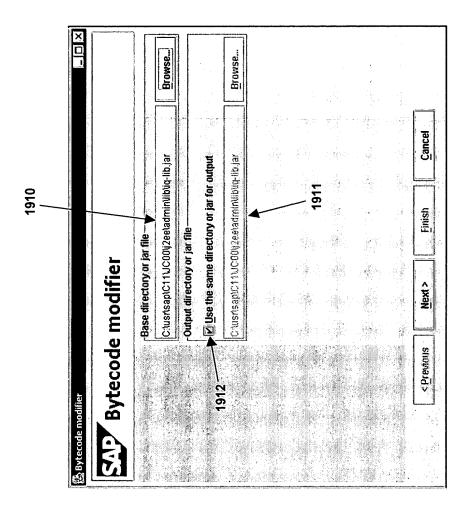


FIG. 19B

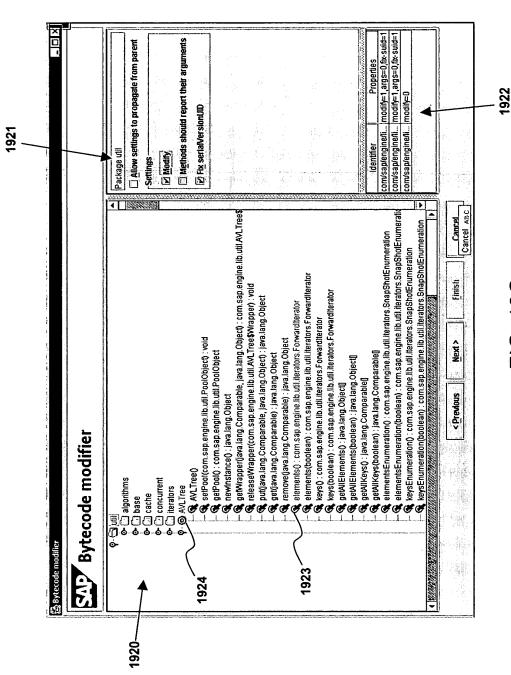


FIG. 19C

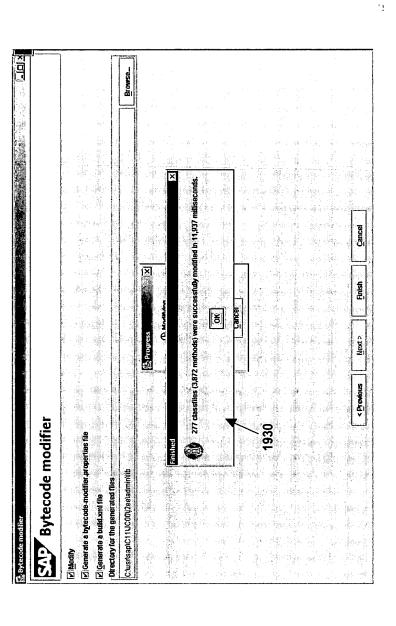
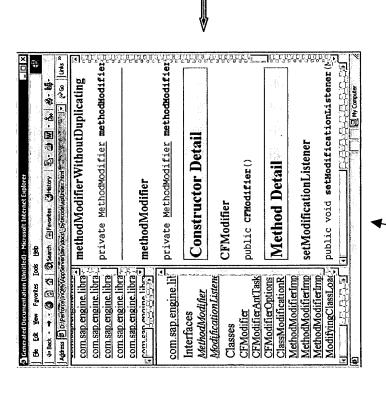


FIG. 19D



// Direct modification of a file
CFModifier modifier = new CFModifier();
modifier.modify("D:/temp/A.class", null);

// Modification in a classloader
Class defineModifiedClass(byte[] data) {
 CFModifier modifier = new CFModifier();
 byte[] datal = modifier.modify(data);
 return defineClass(datal);
}

FIG

1940

	Command Prompt
	<pre>&gt;java -classpath bytecode.jav com/sap/engine/libvavy/bytecode/* Usage: modify <conf-file> {input-file&gt; [ (output-file&gt;]</conf-file></pre>
1901	<pre></pre>

FIG. 19F

<taskdef name="modify"
</pre>

**ANT Builder** 

1902

**EXT 1903** 

classname="com.sap.engine.library.bytecode.modifier.ModifierTask"

classpath="bytecode.jar"/>

<modify conf="bytecode-modifier.properties"</pre>

inputFile="D:\temp\classes" outputFile="D:\temp\classes1"

check="true" verbosity="2" failonerror="true"/>

\_ ;

FIG. 19G